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THESIS

**AN EXAMINATION OF THE NAVY'S
SUPPLY SYSTEM SUPPORT OF
NAVAL SHIPYARDS**

by

Paul J. Browning

December, 1994

Principal Advisor:

Alan W. McMasters

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NAVAL SHIPYARDS

by

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Lieutenant, SC, United States Navy
B.S., University of South Carolina, 1984

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of the requirements for the degree of

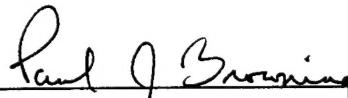
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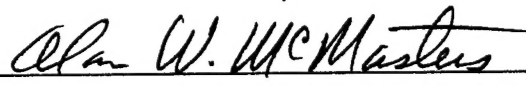
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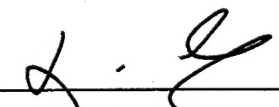
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ABSTRACT

This thesis examines Navy supply system support provided to the Naval shipyards. Maintenance Support Managers at Naval Supply Systems Command (NAVSUP) have indicated that Navy industrial activities desire NAVSUP to buy and issue material to meet the Required Delivery Date (RDD). Shipyard planning activities' material forecasting procedures and the entire requisition process were examined. A review was also conducted of efforts at the Ships Parts Control Center (SPCC) to ensure industrial requisitions met the RDD. The results of the review showed that the supply system cannot automatically match all forecasted requirements against the shipyard requisitions. In addition, shipyard planners are not aware of the UMMIPS time standards for requisition processing. One recommendation is for SPCC to increase the requisition match rate by expanding the number of possible ways to match industrial requisitions to the Pre-Planned Requirements (PPR). Another is to have shipyard Supply Departments conduct UMMIPS training sessions so that better RDD values are assigned by personnel involved with the requisition process.

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I. INTRODUCTION

A. BACKGROUND

The mission of logistics is to get the right goods or services to the right place, at the right time, and in the desired condition in order to satisfy the needs of the customer (Ballou, 1992, p.5). One of the principal areas of support desired by Naval Shipyards is material receipt by the Required Delivery Date (RDD). The RDD is important because key event schedules for completion of maintenance are critical for the shipyard to meet its goals of returning a ship to active service on time and within budget.

In February 1990, the Naval Supply Systems Command (NAVSUP) began to develop a customer-based management system that would more effectively measure the effect of supply support on maintenance efficiency, stock replenishment and readiness requirements. As a consequence, a survey of all industrial customers was conducted in order to obtain a maintenance perspective.

The industrial customers questioned in this survey indicated that NAVSUP should be buying and issuing material to meet their specified RDD. To accomplish this, NAVSUP directed the formation of Process Action Teams (PAT) to determine the extent to which RDDs are met, realign the buying and material management processes to prioritize by the RDD, and to work closely with all industrial customers in order to constantly improve the process.

The first product of this process was the development of the MILSTEP (Military Supply and Transportation Evaluation Procedures) RDD Effectiveness Report which is now sent to all industrial customers on a quarterly basis. MILSTEP is designed to produce uniform DOD-wide logistics performance

measurement reports to be used in evaluating performance of each segment of the requisition pipeline.

The MILSTEP report contains requisition data for all activities such as SPCC, ASO, DLA and GSA. A current weakness with this report is that it uses the actual shipment date, document identifier "AS1" as found in the Transaction History File, to compare with the RDD. There is no allowance for transportation time and receipt takeup time by the requisitioner. Despite this limitation, Figure 1 gives an example of the data provided by this report. The percentages reflect the effectiveness of the supply system in meeting the RDD's of Norfolk Naval Shipyard, typically between 80-90%.

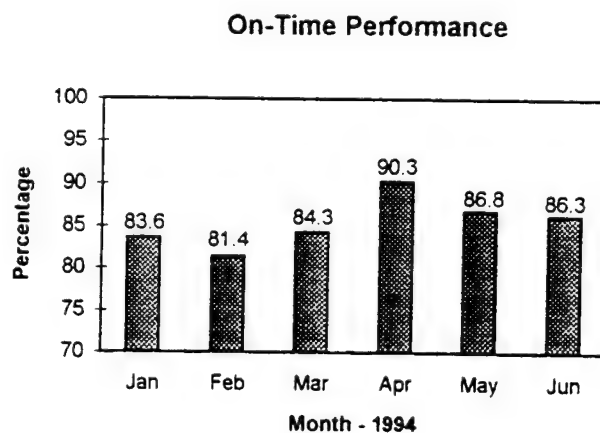


Figure 1. Required Delivery Date On-Time Performance.
(From NAVSUP Corporate Information System, August 1994)

In order for senior managers and employees to have access to corporate statistics, The RDD On-Time Performance Report has been added to the NAVSUP Corporate Information System (CIS). With CIS, managers are able to obtain data either on overall RDD effectiveness or stratified by number of days late. Additionally, the data can be further broken down by

UIC (Unit Identification Code) or by Cognizance Code (COG 1R,1H,7H/R/E).

1. UMMIPS Time Standards

UMMIPS (Uniform Material Movement and Issue Priority System) prescribes DOD policy for determining the priority ranking of material requirements for all DOD components. This policy applies to the requisition, issue, and movement of all material with time standards stated for each segment. These time standards are supposed to be the upper bound on actual times for each segment.

2. DMRD 915

In 1989 Defense Management Report Decision (DMRD) 915 addressed several proposals which focused on reducing DOD transportation costs. One of the issues discussed was an initiative to change the Issue Priority Group (IPG) policy. At that time, the priority system not only established the criticality of the requisitioner, but also dictated the mode of transportation. Often the criticality is replenishment of the requisitioner's inventory, and immediate shipment is not required. Studies conducted by DOD have indicated that over 90% of the high priority requisitions were not time sensitive. As a result, unnecessary depot processing and transportation costs are being incurred. The suggestion was to use the IPG for allocation of inventory and to establish a separate transportation priority system.

As a consequence of DMRD 915, DOD Regulation 4140.1R, known as the "Super Reg", was issued in January 1993. This document provided guidance for the uniform management of all DOD material. One of the policies established by this regulation stated that the customers of the logistics system will utilize UMMIPS to identify the relative priorities of their demands for material and separately identify the response time of the distribution and transportation systems

in setting their RDDs. (The details of this regulation concerning UMMIPS will be discussed in the next chapter.) All supply activities were then directed to design their systems to meet the service levels dictated by the customer's priority designator, RDD, and approved project codes. If a customer has a specific date on which delivery is required, the date is entered as the RDD. Unless the RDD is unreasonable, the customer should expect delivery on or before the RDD. On the other hand, if a customer has a high priority requisition, but does not specify an RDD (i.e., the RDD is blank) the customer should expect the total time from order placement to delivery to be within the total order and ship time specified in the new UMMIPS times standards in the Super Reg.

3. OPNAV Instruction 4614.1F versus the Super Reg

During the course of research, several problems have been noted with the UMMIPS procedures as interpreted by Navy activities. The initial guiding instruction was OPNAV Instruction 4614.1F, dated 15 April 1983, which implemented DOD UMMIPS policy for use within the Navy. This instruction does not have the same time standards as the Super Reg for each segment of the requisition pipeline and it does not emphasize RDD as vigorously. Additionally, in discussions with shipyard planners and supply personnel (the customers), it was discovered that the majority of them were familiar with OPNAV instruction 4614.1F. However, these same individuals did not know what the old or new time standards were for ordering material from the supply system.

B. OBJECTIVES

In order to suggest appropriate improvements, this thesis examines the material support provided by the Navy's supply system to the Naval shipyards and focuses on the ability of

this system to respond to the shipyards' requirements by the RDD.

C. RESEARCH QUESTIONS

To achieve the objectives, the following question was posed: Does the Navy's supply system provide a shipyard's material requirements by the required delivery date? To answer this basic research question, the following subsidiary questions were asked:

1. How are material requirements forecasted for ships in overhaul?
2. How are requisitions matched to preplanned requirements?
3. How do the shipyards order repair parts?
4. How do the shipyards decide on the RDD?
5. What is NAVSEA doing to improve the way shipyards do business?
6. How are material requirements processed in each segment of the requisition pipeline?
7. What are the time standards for each segment and are they being met by the supply system?
8. What actions are being taken by SPCC to meet the needs of their industrial customers?

D. RESEARCH METHODOLOGY

The information presented in this research effort was obtained through personal interviews of key individuals at the Naval Supply Systems Command, the Naval Sea Systems Command, the Navy Ships Parts Control Center, the Defense Logistics Agency, and the Naval Shipyards at Norfolk, Puget Sound and Long Beach. MILSTEP statistics for each segment of the requisition pipeline and Supply Material Availability (SMA) data was provided by the Operations Research Division of SPCC.

The literature utilized in this research was obtained from multiple sources, including the Naval Postgraduate School Library, the U.S. General Accounting Office (GAO), and Defense and Navy Department reports, manuals and instructions.

E. CHAPTER PREVIEW

The next chapter describes the procedures used by the shipyard Planning Activities to forecast material requirements for ships entering an availability. This includes a description of Pre-Planned Requirements (PPRs) for Navy managed material and Special Program Requirements (SPRs) for DLA managed items. Case Studies are used to describe the problems of matching PPRs/SPRs to drawdown requisitions and the inaccuracies of the process. Chapter II concludes with a description of an effort to reengineer the shipyards' operating procedures through a program called AIM (Advanced Industrial Management).

Chapter III examines the entire requisition process from requirement generation and RDD determination through material receipt. Chapter III concentrates on the procedures and times to complete each step of the process. This examination shows a process which is complex and controlled by different organizations.

Chapter IV investigates the initiatives taken by SPCC to manage backordered industrial requisitions to meet RDD when the Estimated Material Availability (EAD) is beyond the RDD. Chapter IV also describes SPCC's surcharge and the financial impact foregone by SPCC when shipyard RDDs are not met.

Chapter V summarizes this thesis, draws conclusions from the research and makes recommendations for improvements.

II. MAINTENANCE MATERIAL FORECASTING

In order to have repair parts available, especially parts with long lead times, forecasts are made to alert the supply system so that these parts are available by the Required Delivery Date (RDD) to support maintenance availabilities. This chapter will show the complexities of the process and disparities with submitted requisitions. The final section will describe a program initiated by Naval Sea Systems Command (NAVSEA) to overcome the problems discussed by improving business practices and operations in Naval shipyards.

A. PROCESS DESCRIPTION

The advance planning activities for ships and submarines undergoing overhaul commences four to six years before the scheduled start of a specific ship's availability. The planning agent responsible for surface ships is known as the PERA (Planning, Engineering and Repair Activity) and for submarines, SUBMEPP (Submarine Maintenance, Engineering, Planning and Procurement). (Ford, 1994)

Results of the PERA's planning process include the Maintenance Forecast tapes, which are forwarded to Ships Parts Control Center (SPCC), and separate advanced planning documents used by the shipyards to support their material identification and procurement efforts. The PERA forecast integrates the following major data elements in order to predict what, when, where and how much material is required to support a particular availability:

- a. Availability Start Data (ASD): A current listing of ship's depot availability schedules.

- b. Configuration Data: Data provided from the Ships Configuration and Logistic Support Information System (SCLSIS); provides ship specific equipment and component data, such as Allowance Parts List (APL) numbers.

c. Maintenance Planning Data (MPD): Based on specific ship class; indicates what system is to be maintained, the planned task, which industrial activity is assigned the task and the date it is scheduled for accomplishment.

d. Material Files (MF): Identifies the parts required to complete a maintenance action and assigns a Probability of Use (POU) factor. (Fitzgibbon, 1994)

The POU is an engineering risk assessment, expressed as a percentage, which reflects the PERA's judgement for the probability that a certain part will need to be replaced while accomplishing a particular maintenance action. This POU factor is the key element in determining how the supply system will support a forecasted requirement. For example, a repair part with a POU of .40 indicates that this particular part will be required 40% of the time to accomplish a specified task. (NAVSEA/NAVSUP JPAT Report, 1993)

The planning activities then evaluate the risk assessment against the range and depth of each Class Maintenance Plan (CMP) and separate the material requirements into two forecast classifications: Mandatory - relatively high POU; Contingent - relatively low POU. Table 1 shows the variance between the planning activities as to assigning POU factors.

B. MANDATORY MATERIAL FORECASTS

Magnetic tapes with material forecasts as mandatory are forwarded to SPCC quarterly. Each tape covers a five-year window and specifies the items, quantity per hull for a particular availability, assigned shipyard, and the start date. At SPCC the tape is loaded into the Program Requirements System Interface Module (PRISM). PRISM validates the data fields and processes the requirements for Navy and DLA managed material. From this process Planned Program Requirements (PPRs) for Navy-managed material and Special

Program Requirements (SPRs) for DLA-managed material are generated. (Port, 1994)

Planning Activity	Material Manager	POU	Classification
SUBMEPP	SPCC	>= .5	Mandatory
		< .5	Contingent
	DLA	>= .2	Mandatory
		< .2	Contingent
PERA CV	SPCC	1.0	Mandatory
		< 1.0	Contingent
	DLA	>= .5	Mandatory
		< .5	Contingent
PERA Surface	SPCC	>= .5	Mandatory
		< .5	Contingent
	DLA	>= .5	Mandatory
		< .5	Contingent

Table 1. Classification Criteria by Planning Activities.
(From NAVSEA/NAVSUP JPAT Report, 1993)

1. Navy Managed Material

The PRISM program will accept forecasted mandatory requirements if the Availability Start Date (ASD) falls beyond the particular item's Procurement Lead Time (PLT). If the ASD falls within the PLT, the forecasted requirement may also be accepted, provided there are sufficient on-hand or due-in assets available to support normal fleet demand or other previously established programmed requirements. PRISM in both cases determines a Best Estimated Delivery Date (BEDD), which is the estimated RDD for the requirement, considers adds/changes/deletes to the overlay program and assigns "reject PLT" to those forecasted requirements that cannot be supported by the start of the availability. Valid material

requirements accepted by PRISM are then processed as PPRs. (Port, 1994)

Planned Program Requirements (PPRs) are non-recurring additive requirement levels used at SPCC in the Supply Demand Review (SDR) process to ensure availability of material when requisitions are submitted and to enable accurate computation of budget requirements. Each PPR cites a NIIN or NICN, item quantity, document number or PPR control number, RDD, UIC of the ship or repair activity, and stock point to which material is be positioned. Additionally, each PPR is assigned a three-character 500 or 600 series project code to identify the purpose for which it is being established. (NAVSEA/NAVSUP JPAT Report, 1993)

The Supply Demand Review (SDR) process is a computerized method of comparing assets and requirements to determine if a supply action is required. The SDR application is run every two weeks and produces a Consolidated Stock Status Report (CSSR) which reflects asset status and includes SDR recommendations for buys and/or disposals. (NAVSUP P-553)

2. DLA Managed Material

Mandatory forecast requirements identified by the PRISM program as DLA COG are processed as Special Program Requirements (SPRs). A SPR is defined as a forecast requirement required to support a special program or project which is of a non-recurring nature. The SPR is electronically transmitted from SPCC to DLA via AUTODIN. The SPR transmission covers a window of 90 calendar days to three years in advance of the requirement and it specifies information similar to the PPR, such as the NIIN and project code, etc. (DOD 4000.25-2-M)

DLA ICPs measure the size of the requirement being forecasted to determine its acceptability in terms of the risk of long supply being generated. This measurement requires

consideration of the size of the forecasted quantity in relation to the normal demand estimated for the item, the cost of this quantity, supply status of the forecasted item, funding capability of the ICP, accuracy of past forecasts, and the degree of assurance that requisitions will follow. Acceptance under these criteria will generate a "PA" status code which means the forecasted quantity will be satisfied within appropriate Uniform Material Movement and Issue Priority (UMMIPS) time standards. (DOD 4000.25-2-M)

Other status codes generated by DLA include "PB" and "PX". A "PB" status code means that although the forecasted quantity is accepted to the requirements file, DLA requires a requisition to be submitted at least the procurement lead time before the RDD in order for them to meet the RDD. Reject Code "PX" indicates an item which has an Acquisition Advice Code "J" meaning it is not stocked by DLA and that the Industrial Activity will need to submit a funded requisition in time to permit procurement. Other SPR reject codes are used to indicate duplicate requirements, items coded obsolete, or that the source of supply is local procurement. All of the response codes discussed above are processed by SPCC and are provided as feedback to the respective PERA.

In September 1990, in response to restrictions on stock fund investment, DLA amended its use of SPRs in the forecasting process. While still accepting SPRs into the ICP program, SPR quantities regardless of their Acceptance Code, would not automatically be included in its forecast for procurement. DLA Item Managers would consider the SPR quantities as indicators of potential demand with priorities and funding going towards filling demand-based requirements first. (Rodenmeyer, 1994)

C. CONTINGENCY MATERIAL FORECASTS

The PERA produces forecast tapes for Contingency material under each Planned Maintenance Program twice a year and forwards these to SPCC. In general, the contingency forecast quantities are computed as follows:

$$QTY = (SHIPS/FYQ) \times (APLS/SHIP) \times (NSNs/APL) \times POU;$$

where "SHIPS/FYQ" equals the quantity of hulls having at least one component with a Planned Maintenance Requirement (PMR) in a specific fiscal year quarter;

"APLS/SHIP" equals the quantity of components per ship with the application PMR; and

"NSNs/APL" equals the quantity of a specific NSN contained in an APL. (NAVSEA/NAVSUP JPAT Report, 1993)

In order to add some control in the process for Contingency material, NAVSEA has indicated that material with a unit cost in excess of \$5000 shall be separately identified and approved by the Engineering and Planning Officer, after consultation with the customer. Additionally, material having a unit cost in excess of \$2000 shall be approved by the Engineering and Planning Officer. (NAVSEA Material Policy 2b)

1. Navy Managed Material

The contingency forecast is supported at SPCC by establishing a Numeric Stockage Objective (NSO) or safety stock. Unlike mandatory forecast tapes, contingency material forecasts for Navy managed items only cite the NIIN or NICN and 20 separate quarters of forecasted demand. This forecasted demand is factored by the POU for all requirements forecasted for each ship of the class for a unique task/APL combination. (McFadden, 1994)

The NSO computation formula is as follows:

(a) For 1H COG items with only one APL application, the quarterly required quantity will be computed by multiplying

the POU by the total number of requirements for that item during the quarter. For example:

POU		QTR QTY		Factored Quarterly QTY
.2	X	8	=	1.6

In this example, 1.6 would be provided as the quarter's requirement. For items with multiple APL applications, the quarterly quantity is weighted by the value of the POU and the total required quantities for that respective quarter. For example:

POU		QTR QTY		Factored Quarterly QTY
.3	X	2	=	.6
.8	X	3	=	2.4
.4	X	1	=	.4
				<u>3.4</u>

In this example, 3.4 would be provided as the quarter's requirement.

(b) For Depot Level Repairables (DLRs), the calculation is as follows:

$$CH * (1-SR) + \frac{(CH)(SR)(T)}{L}$$

where; CH = Changeouts over the Procurement lead time

L = Procurement lead time in quarters

SR = Repair survival rate

T = Turnaround time in quarters

and the following guidelines apply to rounding:

- when the result is 0, establish a NSO of 0
- when the result is >0 but <=1, establish a NSO of 1
- when the result is >1 but <=1.4, establish a NSO of 1
- when the result is >1.4 but <=2, establish a NSO of 2
- for results >2, use same rounding criteria as shown in (c) and (d). (McFadden, 1994)

The NSO quantity is loaded into the SPCC UICP Program and a low limit Reorder Level (ROL) is recomputed for the forecasted item. For example, if a particular item has a ROL

quantity of three based on recurring demand, and a Contingency Forecast generated an NSO quantity of five, then the forecast will drive a buy for an additional two items. Likewise, if the demand based ROL quantity is ten, and the forecast generated NSO quantity was five, the low limit ROL would remain ten, and the NSO forecast would have no impact. (NAVSEA/NAVSUP JPAT Report, 1993)

A deficiency in the process occurs when an item is common to two or more Class Maintenance Plan forecasts. In this instance each successive Contingency Forecast quantity will overlay the previous NSO quantity and may not impact the low limit ROL. (NAVSEA/NAVSUP JPAT Report, 1993)

In response to increased restrictions on Stock Fund investments, SPCC has initiated a stringent manual review of high value Planned Maintenance NSOs and compared the previous two years' recorded demand history with the forecasted requirements to amend the projected quantities as appropriate. SPCC further intends to extend this review to include Planned Maintenance NSOs with a low POU and IMECs of 0,1 and 2 (non-critical). (Port, 1994)

2. DLA Managed Material

Contingency Maintenance Forecasts for DLA managed material is initially processed by SPCC to establish Supply Support Requests (SSRs). An SSR is a document or a group of documents submitted by SPCC to DLA that provides the projected requirements for retail and wholesale stock (DOD 4140.26-M). As was the case for Navy-managed Contingency Material, SPCC receives forecasts from the Planning Activities. SPCC validates the item's stock number and then transmits the requirement to DLA as a SSR. (Port, 1994)

SSRs are automatically processed in accordance with DLA Manual 4140.2, Vol II, to determine the validity of data received, the availability of stock numbers, and the status of

all available stock numbers. Advice as to acceptance and/or rejection of supply support is forwarded to the submitting activity (SPCC) within 25 days after receipt. DLA's SSR stockage policy for its ICPs to follow is:

a. When the quantity is greater than five, a buy is generated.

b. When the quantity is less than five, the item will be coded non-stocked, unless an activity submits a Weapon System Essentiality Code of 1,5,6, or 7 for the item. In these cases, the items will be coded as stocked and DLA will buy an insurance quantity of three.

c. For non-stocked items with no Weapon System Essentiality Code, the item is given an acquisition advice code of "J" meaning local purchase will be made at the time when the item is ordered.

D. REQUIREMENTS DETERMINATION PROCESS

Advanced Planning Documents which have been developed by the PERA are provided to the shipyards three to thirty-six months prior to the start of a specific ship's availability (Ford, 1994). Table 2 provides an indication of the basic planning documents provided by SUBMEPP and PERA Surface.

As can be seen by the various planning documents, the shipyard's maintenance material determination process commences many months before the start of the scheduled Availability or Overhaul. This provides adequate time to identify and procure long lead time material, review the PERA'S Advance Planning Documents and refine the preliminary work packages through the Pre-Overhaul Test and Inspection (POT&I) process. (Fitzgibbon, 1994)

These POT&Is provide additional information that allows refinement of the work package estimates in terms of time, cost, and material requirements. The culmination of this process leads to the proposed SARP. Approximately 6 months before the start of the availability, the Proposed SARP is

presented at the Work Definition Conference (WDC).
(Fitzgibbon, 1994)

Planning Activity	Document	Provided to Shipyard	Contents
SUBMEPP	Availability Work Package	A-21 to A-15 ¹	All authorized work for a specific hull
	Work Package Supplement (WPS)	A-21 to A-15	APL (Allowance Parts List), Maintenance Stds, Component Identification
	Maintenance Material List (MML)	Quarterly	Ship Work List Identification Number (SWILIN)/APL for all components
PERA	Job Material List (JML)	A-8	Specifies material list for Class "B" overhaul
	Preliminary Ship Alteration Repair Package (SARP)	A-12	Specifies maintenance task, location and number of equipments

Table 2. Schedule for Advance Planning Documents.
(From NAVSEA/NAVSUP JPAT Report, 1993)

The WDC is chaired by the Type Commander (TYCOM) and attended by PERA, shipyard and ship's personnel. Available TYCOM maintenance funds are matched to selected work items included in the Proposed SARP to form the Authorized Work Package for a given ship and availability. At the conclusion of the WDC, the TYCOM authorizes the shipyards to start acquiring material to support the Approved Work Package (AWP). (Ford, 1994)

Once the AWP is received by the cognizant shipyard Type Desk, it is issued to the Planning and Estimating (P&E) Division to allocate into work segments. To identify the actual material requirements the Shipyard planners and estimators utilize the following references: Allowance Parts

¹These figures represent the number of months before the start of the availability.

Lists (APLs), PERA's Advanced Planning Products, Technical Repair Standards (TRSs), equipment drawings, technical manuals, Equipment Guide Lists (EGLs), and historical ordering data collected from similar hull types (Lee, 1994).

After a ship's arrival, additional material requirements are identified through the Open and Inspect Records (OIR) process. The "Open and Inspect" portion of the Job Tasking is a very significant phase of the material identification process as it identifies mandatory emergent requirements for component repair at the piece-parts level that were not identified during the advance planning phase by either the PERAs or the Shipyard P&E Division (Lee, 1994).

E. MATERIAL PROCUREMENT

Upon completion of the material identification and requirements determination, Shipyard Planners and Estimators compile Job Material Lists (JML) and forward them to the shipyard's Logistic Support Center (LSC). The LSC was established in Code 500 under the control of the Supply Officer to centrally manage advance planning and ordering.

The LSC is designated as the shipyard's data base manager for the JML system. Its functions include obtaining and maintaining current material planning data as well as providing complete and accurate data for sourcing, requisitioning, and procurement of material. The LSC is composed of both supply and technical personnel. The entire requisition process from requisitioning to receipt will be examined in detail in Chapter III.

In 1985, the accounting firm of Coopers and Lybrand conducted a comprehensive investigation into the management of Navy shipyards. As discussed in one of their findings, required delivery dates (RDD) for materials are unrealistic with respect to actual need dates and the efficient use of

production labor (Coopers & Lybrand, 1985). Specifically, the Naval Sea Systems Command (NAVSEA) policy established by NAVSEA Instruction 4700.8A, Change Transmittal 1, dated 24 January 1983, stated that all work specifications and materials should be available at the start of an availability. This inefficiency led to the use of premium pay for SPCC and DLA to ensure delivery of materials that may not be needed for several weeks or months.

As a result of the Coopers and Lybrand Study, NAVSEA issued the Naval Sea Systems Command Shipyard Material Policies Manual in February 1988. This manual stated that the Required Delivery Date for material should be based on the start of Key Operations/Tasks rather than the start of the availability. Additionally, to ensure proper material management, upon the completion of a key operation all outstanding orders for material not yet received will be reviewed for cancellation.

F. PLANNED REQUIREMENTS

Planned maintenance requirements should be requisitioned from the supply system utilizing a 500/600 series Project Code and a Non-recurring Demand Code "P". The Project Code enables SPCC and DLA to match requisitions to PPRs and SPRs while the non-recurring demand code prevents stock from being procured twice, once for the forecast and once for the requisition. Additionally, one of the following advice codes 5E/5R/5Y/5D/57 should be entered on the document and the 14-digit requisition number should match the number initially entered for the PPR and SPR. (Hornock, 1994)

A General Accounting Office investigation into planned program requirements in 1993 found weaknesses in SPCC's internal monitoring and control of PPRs. Specifically, SPCC's files contained duplicate and unauthorized planned program

requirements, as well as inappropriate requirements for which SPCC had not budgeted. Finally, SPCC's written guidance for validating planned requirements were deemed inadequate. GAO's concern was that duplicate and unauthorized requirements could result in the possible procurement of unneeded materials. (GAO/NSIAD-93-151)

The two types of PPRs which affect the industrial customer are those for scheduled SHIPALTS (Ship Alterations) and Planned Maintenance. SPCC Code 033 does a manual match of SHIPALT PPRs with a resultant 93% match rate between the requisition and the PPR. The manual methodology matches UIC (Unit Identification Code), NSN and time frame of the availability within a six-month window either side of the start date. (Weir, 1994)

For Planned Maintenance PPRs there is no data which shows the rate that PPRs match incoming industrial requisitions. The "best guess" match rate is between 40% and 80%. These figures are usually after-the-fact using manual review of the records to try and make the requisitions match. It is impossible to attempt a total manual match because the number of PPRs for this type of work typically is much too large. (Weir, 1994)

Currently, the automated part of the Uniform Inventory Control Program (UICP) is unable to make the match with all of the parameters listed in the first paragraph of this section. The main reasons for this are that the Unit Identification Code (UIC) often doesn't match the input UIC for the PPR and the wrong project code, advice code and/or demand code are used or they may be missing from the requisitions. Attempts are being made at SPCC to manually try to match the requisitions in the Transaction History File (THF) with one or more of the parameters. If this can be done the "hit" is counted as a filled PPR. This matching process will also

include making a comparison of PPRs to completed requisitions in the previous six months which contain a Shipyard, SIMA or SUPSHIPS Document Identification and any ship of the Class UIC in the supplementary address. (Hornock, 1994)

DLA is experiencing the same problems as SPCC in attempting to match the requisition to a SPR using the same criteria as indicated above. A recent DOD Inspector General Audit discovered that all DOD activities submitted Special Program Requirements (SPRs) to DLA that were inappropriate or were for excessive and unsubstantiated quantities. In addition, DOD activities subsequently submitted requisitions that could not be readily related to the SPR's for which the supply support had been planned. For example, when a shipyard orders DLA material from the Fleet and Industrial Supply Center (FISC), there are no internal controls to ensure that the proper requisition format for an SPR is used. Since this requisition does not indicate to the supply system that it is an SPR, the records continue to show the SPR as unfilled, when in fact it actually is. (DOD IG Audit, 90-087)

After DLA Headquarters staff completed a comprehensive review of the SPR program, they established a communications network called Industrial Forecasting Support Group (IFSG). The purpose of IFSG is to achieve a consistent level of support from DLA through extensive coordination efforts with the Services' major industrial maintenance activities. The IFSG will provide a single face to the customer and would be responsible for closely coordinating filling the SPR requirements of the requesting industrial activities with greater accuracy and confidence. (St. John, 1994)

Concurrently, DLA is developing a SPR Automated Information System to provide better statistical information regarding SPR usage by service and activity. The program will use 15 possible match combinations in order to match SPR

documents to requisitions in an effort to determine validity of service forecasts. SPR matching data will be used to monitor the SPR program as well as provide feedback to industrial activities to assist them in improving their forecasts. (St. John, 1994)

G. CASE STUDIES

In 1993 the NAVSEA/NAVSUP Joint Process Action Team (JPAT) conducted several case studies to examine in detail the Industrial Material Forecasting for three different ship class hulls. The results of two of those case studies, which involved the USS CROMMELIN (FFG-37) and USS CARL VINSON (CVN-70), show the difficulties with the current forecasting process and attempts to match corresponding requisitions to the preplanned requirements. The CROMMELIN case focuses on SPCC-managed parts while the CARL VINSON case looks at DLA-managed material. The accuracy of the data used by the NAVSEA/NAVSUP Team was directly related to the discipline applied by the shipyard to assign appropriate project codes on their maintenance requisitions.

1. USS CROMMELIN Case

The USS CROMMELIN case study made comparisons between the PERA forecast for the availability scheduled from March 1992 to September 1992 with SPCC's Transaction History File. The requisitions examined covered the period January 1991 to August 1992 with a Pearl Harbor Naval Shipyard UIC (00311) and/or CROMMELIN's supplementary address UIC or the three-digit Project Code beginning with 54_.

The following NSN populations were determined for this specific availability by the JPAT from the maintenance forecast:

63 NSNs were SPCC items supported as PPRs;
147 NSNs were SPCC items supported as NSOs; and
1 NSN was a SPCC item mistakenly identified as both
Mandatory and Contingent by PERA.

A comparison of the mandatory items (PPRs) in the Maintenance Forecast and SPCC's Transaction History File (THF) data showed 80 NSNs with an UIC and Project Code match for this availability. The following results were obtained:

- (a) 52 NSNs were forecasted by PERA Surface but were not requisitioned by the shipyard;
- (b) 11 NSNs were forecasted by PERA Surface and were requisitioned by the shipyard; and
- (c) 69 NSNs were not forecasted by PERA Surface, and were requisitioned by the shipyard.

For SPCC-managed items classified as contingency, the following information was obtained:

- (a) 142 NSNs were forecasted by PERA Surface and were not requisitioned by the shipyard;
- (b) 75 NSNs were not forecasted by PERA Surface, but were requisitioned by the Shipyard; and
- (c) 5 NSNs were forecasted by PERA Surface and were requisitioned by the shipyard.

2. USS CARL VINSON Case

This case, which looked at DLA material only, compared items in the PERA CV Maintenance Forecast for the overhaul scheduled from September 1990 to September 1992 with the job material listing (JML) and requisitions submitted by NSY Puget Sound to DLA. This analysis revealed the following figures:

Total Non-Nuclear NIINs:	1,390	Forecasted;
	11,807	Total requirements.

From a comparison of the DLA COG items classified as mandatory (SPRs) with the actual requisitions, the JPAT obtained the following information:

- (a) 643 NSNs were forecasted by PERA CV and were not identified in the shipyard's JML nor later requisitioned;
- (b) 708 NSNs were forecasted by PERA CV, were identified in the shipyard's JML and were requisitioned;
- (c) 9,769 NSNs were not forecasted, but were identified in the shipyard's JML and were available from the supply system(DLA); and
- (d) 1,291 NSNs were not forecasted, were identified in the shipyard's JML and were not available from the supply system (DLA).
- (e) 39 NSNs which were forecasted by PERA CV. However, they were acquired via local procurement.

H. NAVSEA SHIPYARD MANAGEMENT IMPROVEMENT INITIATIVE

This section examines a program initiated by Naval Sea Systems Command (NAVSEA) to improve business practices and operations in Naval Shipyards. This examination commences with an identification of the management problems experienced at the shipyards as outlined in the Coopers and Lybrand study.

1. The Coopers and Lybrand Study

The Navy currently maintains eight shipyards to overhaul, repair, modify and outfit surface ships and submarines. As a result of the BRAC (Base Realignment and Closure) process, this number is shrinking to five shipyards located at Portsmouth NH, Norfolk, Puget Sound, Long Beach and Pearl Harbor. It is anticipated that as a result of BRAC 95, the Navy may lose another shipyard.

The Naval Industrial Fund (NIF) was created in 1949 to administer finances for Navy-owned industrial and commercial activities. Today, the NIF operated under the Defense Business Operations Fund (DBOF) is a \$15 billion-a-year operation with the majority of funding going to Navy shipyards, aviation depots, ordinance stations and public works centers. In the mid-1980's, the four groups of

activities had several major problems. Their facilities and equipment were aging and becoming obsolete. Additionally, costs were escalating rapidly and productivity was falling. The net effect of these problems caused shipyard products and services to cost more than private sector sources and there were large backlogs. (Naval Industrial Improvement Program Initiatives, 1989)

These problems motivated the Office of the Assistant Secretary of the Navy (S&L) to commission the accounting firm of Coopers and Lybrand to assess the Navy Industrial Fund and Naval Industrial Fund Activities in 1985 and to make suggestions for improvement. Major issues addressed were: Headquarters Relationship with the shipyards, Management Control Systems and Techniques, Business Management Training and Experience, and Material Management.

The Coopers and Lybrand study defined Material Management to include those functions which cover the identification, procurement, storage, inventory control and distribution of repair and alteration parts and equipment required to support production. It was found that shipyards had excess inventory, while key parts were not available and procurement lead time was too long. All of these factors drove costs up and delayed work.

The observations from the Coopers and Lybrand study covered the following five major categories:

(1) Shipyard Planning and Control. Shipyards do not have an effective planning base from which to establish accurate materials requirements for ship availabilities or to measure actual performance in material ordering versus material usage. This fact was confirmed in Section G by the results of the NAVSEA/NAVSUP JPAT case studies.

(2) Materials Management Information Systems. Current systems are not designed to effectively support materials

planning or procurement. The material management (MM) subsystem of the Shipyard Management Information System (SYMIS) is capable of tracking material, but does not support materials planning or procurement.

(3) Materials Planning. Materials planning is currently based on specific production plans or schedules (Geuard, 1994). However, the procedure precludes planning direct material requirements effectively for future overhauls because complete and accurate data on usage are not collected, and information about usage on prior overhauls is not analyzed to determine future materials requirements.

(4) Procurement. Systems do not exist for joint procurement between shipyards. There is no system to combine requirements for different shipyards on commonly-purchased items to reduce costs on a routine basis. Additionally, there is no automated system to provide access to current data on procurement history and vendor performance.

(5) Inventory Management and Control. Materials are ordered for specific job order/key operations end use, but considerable material ordered and received is never issued for use. Materials issued for work-in-process are not tracked or controlled after issue. Materials issued against a given job may be applied to that end use or may be used in another application or may be used to replenish stock used earlier from a "gold pile".

2. Advanced Industrial Management (AIM) Program

As a result of the specific problems identified in the Coopers and Lybrand Study and the premises of the National Performance Review (reinventing government), there is pressure for use of more business-like practices at all levels of government. This requires a comprehensive business process reengineering effort as the means to achieve the solution (Bankes, 1994).

The shipyard management initiative taken by NAVSEA is to implement the Advanced Industrial Management (AIM) Program. AIM is a redesign of the Naval Shipyard core business processes for planning and managing production work for ship repair and modernization. The AIM/BPR (Business Process Reengineering) approach depends on clearly defining the guiding principles of the business and designing new, more efficient alternative processes. (Bankes, 1993)

The result of the reengineering effort is not supposed to be the development of an entirely new computer hardware and software system. Rather, AIM is the creation of a system to interface with existing shipyard systems such as Material Management (MM) in order to make them more efficient by quickly providing more information to more users.

The AIM Business Model consists of the Process Model, Object Model and AIM Products. The Process Model identifies the ten high level processes critical to shipyard performance:

- Strategic Planning: Develops strategic requirements for facilities, workforce, and skills, plus standard planning tools and operational guidance.

- Contract Administration and Financial Control: Creates the project budget, administers the contract and funds, reports project and financial status to the customer.

- Project Planning and Management: Defines objectives, key events, milestones, test boundaries, high-level resource strategies, and project planning timetable elements.

- Job Planning: Contains the necessary technical and procedural information for the mechanic to perform the work without the need to request additional information after the work begins.

- Technical Information Management: Captures planning documents from all shipyards to increase reuse of data, and provides access to accurate technical information.

- Resource Control: Develops and maintains plans to properly control and allocate shipyard resources among all shipyard projects. Resources include: labor (various trade skills), materials, tools, equipment, and facilities.

- Project Scheduling and Sequencing: Provide the level of detail necessary for effective project management in support of the Project Execution Strategy.

- Work Packaging and Control: Controls the release of work and achieves economies through packaging tasks for efficient work execution.

- Execution Control: Controls and coordinates the execution of work on a daily basis. Sets task priorities and manning, reports task status, manhour expenditures, resource usage and any problems encountered in the work.

- Performance Measurement Control: Collects, analyzes, and reports task level performance data.

The AIM Object Model focuses on the types of data needed in the Business Model (Activity, Financial Information, Network, Resource, Schedule, Strategic Information, Technical Information and Work Definition). The AIM Products consist of those created, maintained or utilized within the AIM Process Model which significantly contribute to the planning and management of resources and work required to accomplish a project (AIM GPD, 1992). The following items are the major AIM products:

- Shipyard Strategic Plan and Shipyard Operations Plan
- Work Definition Document
- Project Management Plan
- Shipyard Resource Plan and Project Resource Plan
- Task, Task Group, and Task Sheet
- Project Network/Schedule
- Project Manpower Pool
- Work Kits (materials/special tools to do specific jobs)
- Work/Test Control Documents
- Task Package
- Performance and Variance Reports

Refinement of the AIM Business Model was conducted at a neutral site, the Naval Shipyard Development and Integration Test Site located at Norfolk NSY. This was established primarily for the development, integration, test and validation of the Model before it was actually implemented at the shipyards. This setting minimized the variation caused by different business practices followed at the shipyards. (Bankes, 1993)

In order to prevent the shipyards from becoming overwhelmed, AIM is being implemented in two primary steps, Baseline AIM (BAIM) and Full AIM (FAIM). Baseline AIM has five of the ten core business model processes and is currently in various stages of implementation at all of the shipyards not scheduled for closure. Full AIM is expected to be in place during FY95. (Bankes, 1994)

a. Materials Requirements (MR) Subsystem

The Material Requirements Subsystem which is located in the Resource Control module of the AIM Program creates all varieties of Job Material Lists (JMLs), which are used to requisition material, tools, parts, and services. Though not fully implemented in the AIM system, MR will interface with the shipyard's MM system in order to standardize material ordering. Several main goals of MR include: provide one system to order ship and non-ship (admin) requirements; batch routing and processing of requirements to remove paperwork; purchase expediting using Electronic Data Interface (EDI) with vendors; provide query capabilities for local and corporate JMLs; provide query capabilities for local and corporate Actual Material Usage files; reduce time required for material inspection by having data readily accessible on computer screen versus the current method of "searching" for inspection paperwork. (Fargo, 1994)

The MR software package is undergoing development at the present time. Initial testing is expected to begin at Puget Sound NSY in January 1995. Upon successful completion of these tests, MR will be exported to all shipyards commencing March 1995.

b. MM/AIM Relationship

The material ordering process begins with the Planner using the automated AIM (MR) system to order material. Next, the requirement is sent to the Supply Department at the shipyard via the MM system. That department sends the requisition for standard stock material to the supply system or a contract is sent to a vendor. In both of these cases the MM system tracks the status of the material through receipt/storage at the shipyard.

When AIM has determined the schedule of work, a kit is prepared for the mechanics/technicians. This kit includes the material, tools, task sheet as well as other required resources. AIM tracks the job until completion at which time the workers return the excess RFI (Ready For Issue) material to Supply where the MM System takes over. The workers also provide Actual Material Usage information which is tracked by AIM (MR) for future planning.

Overall, the ultimate success of AIM will be measured in terms of productivity increases, reduced ship overhaul cycle times and dollar savings to the Navy. Additionally, by having planning data from previous jobs easily accessible in a corporate repository, PERAs can more accurately determine the POU factors which impact material forecasts.

I. SUMMARY

The purpose of this chapter was to explain the entire process of forecasting material requirements for ships undergoing maintenance availabilities. It showed the

complexities of the process as well as the disparities between forecasts given to SPCC and DLA with the requisitions submitted to either supply system. The important point to remember is that the items ordered after the start of the availability impact the system and its ability to respond to the requisitioner by the Required Delivery Date (RDD), especially if the items are not in stock. The final section described the NAVSEA AIM program initiative designed to overcome the deficiencies described throughout this chapter. Chapter III examines the entire requisition pipeline from requirement submission through material receipt.

III. MATERIAL REQUISITION PROCESS

Material or services are obtained by either submitting a requisition to the supply system which consists of the Navy, Defense Logistics Agency (DLA), and General Services Administration (GSA) or submission of a purchase requisition to a buying activity for procurement from a commercial source. This chapter examines the procedures and the times for each of the following segments of the requisition pipeline: Naval Shipyard submission to Point of Entry (POE), Passing action and Inventory Control Point (ICP) determination, Storage site processing and Packaging, and Transportation and Receipt processing.

A. NAVAL SHIPYARD REQUISITION SUBMISSION PROCESS

This section examines the procedures used by Norfolk Naval Shipyard (NNSY) to order material for scheduled maintenance. These procedures are similar to those used at the other shipyards. In all cases, the sources of input for requisitions are the Topside Planners who do the advance ordering of material prior to the start of the Availability and the Shop Planners who order material after the start of the job.

All of the shipyards currently use an ADP system to automate the preparation of Job Material Lists (JMLs); the first step in ordering material. Norfolk Naval Shipyard uses a system called APS (Automated Planning System) while the other shipyards use a system called AMPS (Automated Material Procurement System). Both APS and AMPS are integral parts of the AIM (Advanced Industrial Management) Program which was discussed in Chapter II. Even though JMLs are becoming more automated, handwritten JMLs are still prepared for emergent, work stoppage requirements. During conversations with a Planning Supervisor at NNSY, he indicated that approximately

5% of the JMLs are handwritten and walked through the requisition submission process.

In preparing JMLs the key data elements besides the stock number and quantity are the priority and required delivery date (RDD). The priority assigned is based on an Urgency of Need Designator (UND) and the Force/Activity Designator (FAD). The UND is either an "A", "B" or "C", with "A" associated with the highest degree of urgency. A FAD is a Roman numeral (I through V) assigned by the Secretary of Defense, the Joint Chiefs of Staff, or a DOD component to indicate the mission essentiality of an organization to meet national objectives (DOD 4140.60). All CONUS industrial and intermediate maintenance and repair activities are assigned FAD III with the following assigned priorities based on the UND: 03, 06, 13. Guidelines in OPNAV Instruction 4614.1F indicate that shipyards can only assign Issue Priority Group (IPG) 1, priorities 01 - 08, on 50% of their requisitions per month.

1. Priority and RDD Determination

Planning Supervisors interviewed at several shipyards offered similar means of assigning priority and RDD. If the availability is to begin greater than six months from today, priority 13 is used with an RDD that coincides with the start of the availability. At the 60-day point, the priority is upgraded to 06 with RDD assigned to the start of the key operation. At 35 days before the arrival of the ship and during the entire availability, priority 03 is used. Again, the RDD is based on the start of the key operation. However, several of the supervisors indicated that once the ship is in the yard, the "rule of thumb" which they follow is to have the RDD equal to the Julian Date (JD) of the requisition plus 3 days. For all material requirements, the requisition numbers are assigned locally by the Planners or Shops from a pre-assigned set of numbers.

Once all of the data elements are entered, the Planning and Estimating Supervisor provides a quality check on the JML by verifying priority, RDD, project code and any advice codes. Despite the efforts of Supply Departments at the shipyards to train personnel on JML preparation, in particular for priority and RDD, some requisitions with "unrealistic" RDDs are passed to the supply system.

Other factors which impact priority assignment as well as RDD are short-fuzed ship assignments as well as last minute funding from the TYCOM for jobs that were previously deleted from the work package. These cause Planners to use higher priorities and short RDDs for emergent work. (Bergamini, 1994)

2. Material Management System

From this point the requirement is released to the shipyard Material Management (MM) system. The MM will screen assets at the shipyard and at other yards. If material is not available, the JML is sent to the Supply Department where the data elements are again verified and the requisition is committed. The batch-processed requisitions are submitted by the Supply Department to the supply system via MILSTRIP using document identifier "A0A" in the evening after the close of business. (NNSY P4400-3)

The time standards for submission of requisitions are based on the UMMIPS time standards (DOD 4140.1-R). Table 3 gives a breakdown of those standards for all pipeline segments and will be used as a reference throughout this chapter. The time standards are service level targets which should be met or improved upon whenever physically and economically feasible.

Pipeline	Pri 01 - 08	Pri 01 - 08 (Pri 01-15 for 444) RDD = 444,555,777	Pri 01 - 15 Blank RDD
	RDD = 999, N __, E __		
Requisition Submission	1	1	2
Passing Action	.5	1	1
ICP Availability Determination	1	1	1 ¹
Depot Storage Site Processing/Packaging	1	1	5
Transportation Hold CONUS Intransit	1	4	10
Receipt Takeup by Requisitioner	.5	1	3
Total Order-Ship Time	5	9	22

Table 3. UMMIPS Time Standards in Calendar Days.
(From DOD 4140.1-R)

The Required Delivery Dates shown are defined as follows:

999 Indicates expedited handling for NMCS (Non-Mission Capable Supply) overseas customers or CONUS Customers deploying overseas within 30 days.

N__ Indicates expedited handling due to NMCS Requirement CONUS customer.

E__ Indicates expedited handling due to anticipated NMCS requirement of a CONUS customer.

555 Indicates exception to mass requisition cancellation², expedited handling required.

¹For manually submitted requisitions or requisitions requiring manual review use 1 day for Pri 01-08 and 3 days for Pri 09-15.

²Mass cancellations are caused by events such as base closures, project terminations, ship and unit deactivations or termination of vessel outfitting.

- 777 Indicates expedited handling for other than the above reasons.
- 444 Used by customers collocated with the supply depot or by customers who have obtained collocated status through local negotiations and the fastest possible service of the supply and transportation system is not desired.
- ### Specific date indicates handling to meet that date of delivery. It is considered separate from Table 3.

— Blank RDD indicates routine handling.

Utilizing MILSTEP data provided by the Operations Research Division (Code 046) located at SPCC, Table 4 lists the statistics on the submission times (in days) for the time period from January 1994 to June 1994. The standard deviation column shows that a considerable amount of variability is evident in the process.

CONSIGNEE	IPG ³	NUMBER OF REQNS	AVG DAYS	STANDARD DEVIATION	MEDIAN VALUE
Naval Shipyards	ALL	38,756	4.0	7.9	1.7
	IPG-1	19,200	3.5	8.5	1.1
	IPG-2	10,111	4.5	7.7	2.1
Norfolk NSY	ALL	17,568	3.8	7.2	1.4
	IPG-1	6,598	2.4	7.5	.6
	IPG-2	6,584	3.4	6.0	1.4

Table 4. Shipyard Submission Times, Days.

The data reveals that it takes the Naval Shipyards 4.0 days on average to submit their requisitions to the supply

³IPG (Issue Priority Group); All = priorities 01-15
 IPG-1 = priorities 01-03
 IPG-2 = priorities 04-08.

system. The time period begins with the Julian Date of the requisition and terminates when it is received at the Point of Entry (POE), normally the Fleet and Industrial Supply Center (FISC) which serves the shipyard's geographical location. In the case of NNSY the nearest FISC is located at Norfolk and it takes 3.8 days on average to submit all requisitions to that FISC.

Table 5 shows the percentage of requisitions submitted within UMMIPS standards. For example, 59.4% of all shipyard IPG-1 requisitions are submitted on-time. Though this percentage may seem high, it compares favorably with the median value in Table 4. Despite the overall average of 3.5 days to submit IPG-1 requisitions, the median value by definition indicates that at least 50% of the requisitions were submitted in 1.1 days or less.

CONSIGNEE	IPG=ALL	IPG=1	IPG=2
Naval Shipyards	52.6%	59.4%	40.4%
Norfolk NSY	56.8%	70.9%	52.7%

Table 5. Percentage of Requisitions within UMMIPS Standards.

In discussions with Supply Department personnel at several shipyards it was discovered that delays occur when JMLs are prepared and forwarded to Supply. For automated JMLs they are downloaded from the MM system to magnetic tape in the afternoon, normally by 2:00 p.m. Then they are batch-processed and transmitted to the supply system in the evening. If the requisition is generated by the Planners after 2:00 p.m. then the requisition is held and it is transmitted the evening of the next day. This situation will add an additional day to the measurement of the submission time.

In further discussions with shipyard Supply Department personnel, delays occur with the preparation of manual JMLs, not only for repair material, but also for routine administrative requirements. In addition, manual JMLs are often routed to the Supply Department via the shipyard Guard Mail. Even some Priority 03 requisitions have been passed via this method. Additional delays can also occur when manual JMLs are awaiting supervisor review. In any case, the 4-day average time to submit requisitions impairs the ability of the external supply system to respond by the RDD. This is particularly true when Planners are using their "Rule of Thumb" (Julian Date plus three days) for determining the RDD when a ship is in the shipyard.

3. Urgent Requirements

The procedures are slightly different for manual JMLs for urgently required repair parts. Once the JML is hand carried to Supply, a stock check is conducted at the local FISC. If material is available, then a "Bearer Pickup" is processed. If the material is available at the Inventory Control Point (ICP), then the MILSTRIP is sent in by either phone or FAX with a document identifier AOE. In this case the time standards are greatly reduced through manual intervention in contrast to automated processes.

On the other hand, if the urgently needed repair part is not carried in the supply system and there are no excess items at the shipyard, then the requirement is forwarded to local procurement. For SPCC-managed items which are NIS (Not in Stock), the shipyard should pass the requisition to SPCC and have their procurement specialists buy the item (SPCCINST 4235.150). More often than not, the shipyard will normally go out and purchase the part locally. The Planners and Supervisors at the shipyards the author spoke with indicated that this is the preferred method for them to do business. By

using local purchasing, the shipyard can maintain direct "control" over the procurement process from award to delivery to ensure task deadlines are met.

B. PASSING ACTION AND ICP DETERMINATION

In this section an examination is conducted of the segment known as Referral Processing time which is the period from the date the requisition is referred from the POE until the time it is received at the ISP (Issue Stock Point). This involves two parts, time from POE to the ICP and time from the ICP to the ISP. Since the MILSTEP reporting system is not able to determine the exact time a requisition arrives at the ICP from the POE, both of these UMMIPS segments have been combined into one (Armstrong, 1994).

In the automated environment when a demand is placed on the supply system at a stock point it is usually filled from material available there. The stock point issues the material and forwards a report of the transaction to the ICP via the process called Transaction Item Reporting (TIR). When the ICP receives the TIR, its records are adjusted to show the decrease in on-hand stock. If the stock point cannot satisfy the customer's requests because it is NIS or Not Carried (NC) or possibly it cannot identify the item, or the item is subject to ICP control, then it is forwarded to the ICP. Stock points do not attempt extensive technical identification, substitution, or local purchase unless they have been specifically directed to do so by the ICP. (Lyons, 1994)

The UICP process of receiving, checking, accumulating, and satisfying a customer's request is termed Requisition Processing. The Requisition Processing operation used by SPCC has been automated as much as possible to minimize the human intervention required. However, in situations that only human

judgement can resolve, the data processing system, which is based on "management by exception", will refer the document to the appropriate Inventory Manager (IM) for action (UICP Users Manual, 1992). Some of the items which would cause a manual intervention would include, but are not limited to, the SMIC Code or "Dripper Code" placed on an item by the IM. A Dripper Code, which restricts material from being automatically issued, is normally acted upon the next business day by the IM. However this can be delayed several days if the requisition is received on a Friday and not acted upon until Monday. Overall, any actions which impede the processing of a document increase the time to process the requisition. The time standard as indicated in Table 3 is one day and the result of manual intervention can add another day or two to the requisition pipeline. (Lyons, 1994)

Unlike the Levels Setting, Demand and Lead time Averaging Operations, Requisition Processing is concerned primarily with policy rather than theory. The policy for Requisition Processing is established by the Naval Supply Systems Command and carried out by the ICP's Stock Control Divisions (Lyons, 1994). DLA provides similar guidance for its ICPs.

1. Automated Requisition Processing at SPCC

The foundation of the Requisition Processing (B01) operation is a series of real-time computer programs (on-line, not batch processed) designed to process requisitions through the validation and fill procedures, to update files, and to generate action and status outputs. The programs reject invalid requisitions; generate Stock Status Reports (SSRs) for those requisitions that cannot be processed automatically; process cancellations, follow-ups and backorder release candidates; and handle updating and posting actions (UICP Users Manual, 1992). In discussions with inventory managers

at several DLA ICPs, similar operations are run on their systems.

2. System Material Availability

The total referral processing time is directly related to the System Material Availability (SMA). This customer service measure of effectiveness for the wholesale level is defined as the percent of requisitions which are satisfied on the first pass against system assets. It is computed as follows:

$$SMA(\%) = 100 \times [1.0 - MOE/Demand]$$

where,

MOE = Material Obligations Established = Backorders + DVDs;
DVD = Direct Vendor Deliveries.

The current Navy goal for wholesale SMA is 85 percent (NAVSUP P-553). As an example, Figure 2 provides data from the UICP M67 SMA Report for all 7-COG items (Depot Level Repairables) managed by SPCC for the period OCT 1993 - JUL 1994:

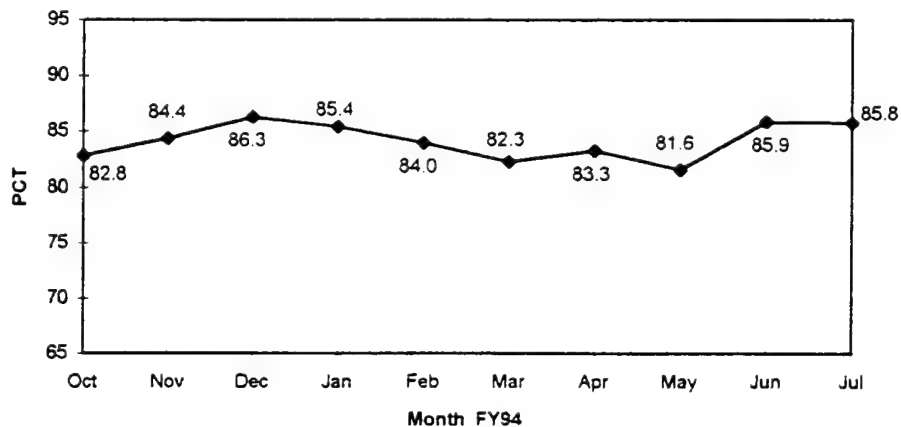


Figure 2. Observed SMA values for 7-COG items managed by SPCC.

Using SMA as a measure, if stocked material is available 85% of the time for issue when a requisition is submitted, then the supply system should be able to fill this percentage

of requisitions on or before the RDD. This assumption is based on the premise that the requisitions are processed within UMMIPS standards for each segment of the pipeline as shown in Table 3, and the requisitioner reasonably assigned a RDD taking into consideration the time standards as well.

Based upon MILSTEP data provided for the period from January 1994 to June 1994, Table 6 shows the statistics on the number of days to process a requisition from the POE to the ISP.

CONSIGNEE	IPG	NUMBER OF REQNS	AVG DAYS	STANDARD DEVIATION	MEDIAN VALUE
Naval Shipyards	ALL	38,756	.8	9.5	.04
	1	19,200	1.2	12.6	.1
	2	10,111	.5	6.0	.04
NSY Norfolk	ALL	17,568	.3	3.8	.04
	1	6,598	.3	5.0	.04
	2	6,584	.2	2.8	.04

Table 6. Referral Processing Time, Days.

As can be seen by the data for Norfolk NSY, it takes less than 1/2 day on average to refer an industrial requisition from the POE to the Issuing Stock Point. The high variability is a result of those requisitions which require manual intervention as discussed above, as well with requisitions in backorder status (BB) or under technical review (BD). This includes the 15% of requisitions not filled as defined by the SMA. The low median value indicates that most of the requisitions were filled immediately from on hand inventories at the POE stock point.

In the next section, stock point processing will be discussed, focusing on procedures and time standards in order to ship material in a timely manner.

C. STOCK POINT PROCESSING

This segment commences when the requisition is received at the Issuing Stock Point (ISP) and terminates on the day when the material has been packaged and shipped.

As a result of Defense Management Review Decision 902, management of service distribution depots (warehouses) and transportation activities were transferred to DLA in March 1992. The processing procedures discussed in this section were obtained through conversations with supervisors at the Defense Depots at Tracy and San Diego, California. These Depots' warehouse operations are different. San Diego has the responsibility of handling Navy-owned material while Tracy handles all DLA-owned inventory for all DOD activities.

Once a requisition is passed from the ICP to the distribution depot at Tracy as a MRO (Material Release Order), the DLA Warehousing and Shipping Procedures (DWASP) system takes over processing at this point. This facility is manpower intensive with stock selected using manual methods.

At formerly Navy operated stock points such as San Diego, when the MRO is received from either the DLA ICP or SPCC, the storage and retrieval function is performed by NISTARS (Naval Integrated Storage Tracking and Retrieval System). This system was designed to interface with FISC's Uniform Automated Data Processing System for stock points (UADPS-U2).

DLA operates an automated warehouse at Sharpe California similar to the one at San Diego. This warehouse is controlled with the Defense Distribution System (DDS) and features high-rise storage racks with manriders. Additionally, features include receiving assist devices including bar code readers and on-line terminals at receiving/inspection stations, storage and shipping stations with bar code readers, and an automated guided vehicle system. At all locations, incoming requisitions are batch-processed at night with picking tickets

dropped for material after midnight. At 0530, the morning shift picks up the tickets and sorts them for workers to start picking material by 0600 with the goal of having everything ready for shipment by noon. Daily work is not stopped until material for all customers has been selected and packaged with documentation attached. This process is 99% effective with the balance attributed to inventory problems or computer downtime. (Geralis, 1994)

In order to standardize the operating systems at all of the DLA warehouses, a system known as DSS (Distribution Support System) is scheduled to replace systems currently in use. This will initially commence with Tracy in January 1995 and Sharpe in February 1995. A few of the functions which DSS will monitor include inventory transactions and transportation scheduling. (Carter, 1994)

After the material has been picked from stock it is packaged and passed to the Transportation Department for shipment processing. At all of the DLA sites, a computerized scheduling system will determine if air or surface modes of transportation will be utilized. At Tracy a sub-routine of DWASP performs this function and at San Diego NAVADS (Naval Automated Documentation System) is used. (Carter, 1994)

At the Transportation Department, the floor is set up by geographical regions and the mode of transportation is determined by several factors as listed below (DDRW SOP 94-001):

1. CASREP/NMCS/PMCS requirements
2. Priority
3. Required Delivery Date
4. Project Code
5. Destination
6. Size and Weight
7. Customer requests or requirements

Though this list is not in prioritized sequence, RDD tends to drive the selection of the mode process. However, if the RDD has expired when an item arrives at the Transportation Department, it will only be expedited if the requisition has a high priority and urgent Project Code or the customer has specifically requested that it be expedited. Similarly, if the requisition has no specified RDD, a routine ticket will be generated to ship the material. (Wagner, 1994)

Once date and mode of shipment are determined, a document with a DIC of "AS1" is transmitted to let the requisitioner know when the material was shipped and mode of shipment. The MILSTEP data in Table 7 shows the statistics on the time taken to complete this segment of the pipeline.

CONSIGNEE	IPG	NUMBER OF REQNS	AVG DAYS	STANDARD DEVIATION	MEDIAN VALUE
Naval Shipyards	ALL	39,006	3.2	6.4	1.1
	1	19,393	1.0	3.2	.5
	2	10,145	2.1	3.5	1.2
NSY Norfolk	ALL	17,593	4.1	6.4	1.3
	1	6,611	1.0	3.6	.7
	2	6,589	1.8	2.3	1.2

Table 7. Stock Point Processing Time, Days.

As can be seen, the average processing time for IPG-1 requisitions at the warehouses meets the UMMIPS standard of one day. For IPG-2 requisitions the average times for all Naval shipyards and NSY Norfolk, in particular, are 2.1 and 1.8 days, respectively. Again, as was observed in Tables 4 and 6, the standard deviation is large and the median values are smaller than the mean. The median values indicate that the processing time for 50% of the requisitions was less than or equal to the median for each IPG. These median values compare favorably with the UMMIPS standards shown in Table 3. For example, when an RDD is assigned the processing time is

one day, however if the requisitioner does not assign an RDD, the processing time can be up to 5 days for all IPGs.

The times for this segment can be slowed when challenges are made with DLA's Airlift Challenge Program. The guidance for this program is provided in DLA-OT Policy and Procedures Memorandum No. 92-02. The goal of this program is to save money by diverting to surface mode those shipments which qualify. Specifically, CONUS high priority (IPD 01, NMCS, ANMCS, 999, 777, 555, JCS Project Codes) and shipments with a short RDD will not be challenged or diverted unless the:

- (1) shipment weighs more than 250 pounds;
- (2) shipment dimensions exceed specified measures of length or width;
- (3) shipment is hazardous material; or
- (4) authorization has been obtained from the requisitioner to divert to surface transportation.

The next section will examine the transportation and receipt segments. Specifically, this will include procedures used to guarantee delivery within UMMIPS standards as well as procedures used at the shipyards to receive material.

D. TRANSPORTATION AND MATERIAL RECEIPT

1. Transportation Segment

This section will concentrate on the transportation of material to CONUS industrial customers. Transportation to activities located outside of CONUS (i.e., Hawaii and Alaska) involves several more steps in the process such as transportation hold delays which add several additional processing days.

As a result of Defense Management Review Decisions 902 and 915, there were significant changes to transportation operations, policies and practices. Under DMRD 902, all military service distribution depots were transferred to DLA in March 1992. All local delivery functions at Navy

activities were assumed by DLA from Navy FISCs on 1 July 1994.

One of the systems which DLA inherited and disestablished in September 1994 was the Quicktrans Air Delivery system. This system previously caused Navy material to be tracked within two systems and delayed by an additional day on average. For example, when Navy material was being shipped out of DD Tracy or the DLA consolidation center at DD Sharpe with a mode of shipment designated as "Quicktrans", it would have to be transshipped to the Quicktrans facility near Travis AFB before shipment to San Diego (Geralis, 1994).

As a result of DMRD 915, several initiatives have been implemented which have reduced transportation costs. As the next subsections will show, with DLA controlling the entire process, a more efficient and streamlined system is possible.

a. Regional Freight Consolidation Centers

Approximately 80% of DOD shipments are less-than-truckload (LTL) which, on average, cost seven times more than full truckload shipments. Regional freight consolidation centers at which many small shipments are consolidated into larger shipments can dramatically reduce transportation costs. DLA has developed a network of consolidation and distribution centers under its Enhanced DLA Distribution System (EDDS) program. The Defense Depot at Sharpe is the consolidation point for the West Coast.

b. Guaranteed Traffic (GT) Program

Under this program for both air and surface shipments, MTMC (Military Traffic Management Command) awards carriers specific traffic routes for a designated period in return for reduced rates. For example, for air freight less than 100 lbs, small package air service with tenders such as UPS or FEDEX are used.

Carrier performance evaluation is an integral part of the DLA GT program. Criteria for carrier performance are

defined in the GT contracts which are monitored by the Headquarters of the Military Traffic Management Command (MTMC). For both air and surface modes, the following carrier service standards are required (DLA, 1994):

(1) Carrier is subject to warning or removal when transit times are met less than 95 percent of the time, or as stated in the GT agreement.

(2) Carrier must perform 100% on-time delivery when "expedited service" is requested.

The following specifications will be used to determine how transit times will be measured:

(1) Transit times are measured in calendar days, including Saturdays, Sundays and holidays.

(2) Transit Time will begin when the Government Bill of Lading (GBL)/Commercial Bill of Lading is signed.

(3) Transit time will end on the day the shipment is delivered or offered for delivery (i.e., the carrier contacts the customer and both agree upon a date and time the shipment can be delivered). When the actual transit times end on a Saturday, Sunday or holiday, the shipment must be delivered on the next business day to be considered delivered on time.

c. Intransit Data Cards

Another means besides the Guaranteed Traffic GBL to document carrier performance and to measure the transportation length of the requisition pipeline is to use Intransit Data Cards (IDC). These consist of TK1, TK2, TK3, TK4 and TK8 documents prescribed in MILSTAMP (Military Standard Transportation and Movement Procedures) which are generated for each GBL. Once the shipment is received by the consignee, the Julian Date is written on the card and it is then mailed to Defense Automated Addressing Systems Office (DAASO) at DD Tracy where MILSTEP data is compiled. The common document used for CONUS shipments is TK4. (DOD Reg 4000.25-3-M)

At Defense Depot Tracy, the DWASP system generates a TK4 document for each Transportation Control Number (TCN) on a GBL. For example, a consolidated shipment of material being shipped from Tracy to San Diego may only have one GBL and one TCN with one TK4 document generated. (Nicholson, 1994)

In general, it was difficult to find anyone who knew anything at all about IDCs. Material Receiving personnel at NNSY had never heard of them and transportation personnel at the DD San Diego said they have not used TK4 documents for several years. However, information was eventually obtained from personnel at DD Tracy. In subsection 2 a discussion will describe how the Navy uses the IDC as one of the elements to determine the transportation and receipt time data.

d. Local Delivery

All of the transportation procedures discussed apply to freight shipments either between regions or Defense Depots. Once material is received at the Depot, it must be segregated for redistribution locally. Normally this process can ensure delivery to the customer by the next day. For the shipyards at Puget Sound and Long Beach, the Defense Distribution Depots which serve those activities provide local delivery service to them. (Hicks, 1994)

Norfolk Naval Shipyard is currently conducting a "direct delivery" test with DLA. Instead of material being shipped from the Depots to the Distribution Depot at Norfolk and then redistributed, the delivery trucks are directed to the shipyard first and then offloaded. Preliminary results are favorable with a savings of an average of two days redistribution time as well as the \$29.00 per line item surcharge for handling into as well as out of the Defense Depot Norfolk. (Charboneau, 1994)

2. Receiving and Receipt Processing at NNSY

The following procedures were obtained from Norfolk NSY and are similar to those followed at other shipyards. At Central Receiving the trucks are off-loaded and material is assigned to a temporary holding bay location on the receiving floor. Tri-walls or other consolidated packages are separated with the location annotated on the receiving papers (DD 1348-1 or vendor delivery list) and the papers are forwarded to the Receipt Processing Unit.

During receipt processing, the requisition number is input into the Material Management (MM) module of the shipyard MIS for processing. After verifying the quantity, stock number, dollar value and other elements, the transaction is processed. A "D6S" is automatically generated at time of receipt and submitted to DAASO to provide material receipt data. This information is required in accordance with MILSTEP in order to determine the length of this requisition pipeline segment. Additionally, a material movement document (MMD) is generated for each requisition, attached to the original papers and returned to the Receiving section.

Workers in this section attach the MMDs to the material and then move the items from the holding section to the delivery section. Daily deliveries are scheduled to move material to the end-user, interim storage or to Shop Stores (retail inventory account).

In addition to normal receipt processing, all shipyards are directed by NAVSEA to report on a quarterly basis all Missing in Transit (MIT) material. This is material which was shipped from a DLA warehouse but, due to mishandling, was inadvertently lost or sent to another activity. The shipyards report each occurrence utilizing a Report of Discrepancy (ROD) which is submitted to the shipping activity. At Norfolk NSY for the period January 1994 to June 1994, 798 RODs were

submitted for Navy and DLA managed material. Even though missing material is not a focus of this thesis, the fact that the system can lose material in transit is significant enough to mention as a negative factor impacting the shipyards.

Table 8 shows the statistics on this segment of the process. SPCC generates this MILSTEP report by making a three-way match with the Document Number, D6S report and the IDC (TK4). The UMMIPS time standard is 1.5 days and the data provided indicates that this segment is performing satisfactorily on average. However, the median value for all IPGs is 2.0 days which indicates that greater than 50% of the requisitions do not meet the UMMIPS standard. This can be attributed to the fact that redistribution of material locally can add additional time to this segment of the requisition pipeline.

CONSIGNEE	IPG	NUMBER OF REQNS	AVG DAYS	STANDARD DEVIATION	MEDIAN VALUE
Naval Shipyards	ALL	7,189	1.0	5.4	2.0
	1	4,045	.4	6.6	2.0
	2	2,083	1.1	3.6	2.0
NSY Norfolk	ALL	4,023	1.1	1.6	2.0
	1	1,710	.1	1.4	2.0
	2	1,370	1.0	1.0	2.0

Table 8. Transportation/Receipt Time, Days.

E. SUMMARY

This chapter has examined each segment of the requisition pipeline. This examination revealed a distribution process which is complex because its numerous segments and nodes are controlled by different organizations: requisition submission is controlled by the industrial activity; ICP stock determination is controlled by either the Navy (SPCC or ASO) or DLA (DGSC, DISC, DESC); stock selection, packaging and

transportation are controlled by DLA; local delivery is controlled by DLA; finally, local receiving procedures are managed by the shipyards. Each of these organizations has different missions, methods of evaluation and independent data systems. Nonetheless, data was obtained for each segment and was presented in Tables 4 through 8. That information has been summed to get the number of days to process a requisition through the system. The segments and the sums are presented Table 9.

SEGMENT	(IPG = ALL)		(IPG = 1)		(IPG = 2)	
	NSY	NORFOLK	NSY	NORFOLK	NSY	NORFOLK
Submission Time:	4.0	3.8	3.5	2.4	4.5	3.4
Referral Time:	.8	.3	1.2	.3	.5	.2
Stock Pt Processing:	3.2	4.1	1.0	1.0	2.1	1.8
Transportation/Receipt:	1.0	1.1	.4	.1	1.1	1.0
TOTAL DAYS:	9.0	9.3	6.1	3.8	8.2	6.4

Table 9. Total Average Requisition Times.

On average it takes all shipyard IPG-1 requisitions 6.1 days and IPG-2 requisitions 8.2 days from submission to receipt. If the supply system is trying to improve on these times than they may have to streamline the operation further. Several large companies such as Motorola have focused on satisfying their customers by reducing logistics costs and processing time as a way of increasing their quality and responsiveness. They have determined that the more steps and "handoffs" involved in the process, the greater the potential for delays, queues and costs (Denton, 1991).

Finally, if the normal processing time for a IPG-1 requisition is 6.1 days on average and the customer puts a RDD on the requisition for 3 or 4 days, then the automated system can not respond on average quickly enough to meet this. The only way to avoid this is to manually process requisitions with short RDDs (i.e., those allowing less than the UMMIPS

standard for processing) as a Bearer Walk-Through or pass it over the phone to the ICP for expedited processing. For other RDDs if material is available for issue, the system as designed should be able to respond to meet the needs of its customers.

In the next chapter an analysis is made to show various SPCC industrial support initiatives to meet the customer's RDD when stock is unavailable or when the estimated availability date for material is greater than the RDD specified by the customer.

IV. SPCC INDUSTRIAL SUPPORT INITIATIVES

As identified in Chapter I, industrial customers have indicated that SPCC should be buying and issuing material to meet the RDD. As a result of this requirement and in view of reduced inventory levels, SPCC has taken the initiative to ensure that appropriate supply actions are taken to fill backordered industrial requisitions being held in open status where the Estimated Availability Date (EAD) is beyond the RDD. In the past there was no procedure in place to ensure that these requisitions were filled on-time. By doing this the command hopes to avoid cancellations and realize sales which supports the Stock Fund and supplements SPCC's surcharge. Moreover, hopefully, "goodwill" will be established between SPCC and its customers as both work together to support the Naval Operating Forces.

In SPCC's Fiscal Year 1994 Strategic Plan goals have been established which provide a comprehensive strategy for the years ahead. To support the concerns of the industrial customers, Tactical Goal #10, "Buy To RDD", was developed. This goal stated, "SPCC will develop and implement procedures to purchase industrial support material to meet the RDD of industrial customers' requisitions". This broad goal assumes that the industrial customers' assigned RDDs are achievable and set rationally. SPCC's industrial customers include all shipyards, air stations, NADEPs, Weapons Stations, SIMAs and overseas ship repair facilities (SRF).

As directed by the Tactical Goal, Code 03 has been specifically assigned the responsibility for managing this effort. Two divisions in this code actively involved in the day to day efforts to satisfy the needs of the industrial customers are Code 0311 (Industrial Expeditors) and Code 033F (RDD Managers).

This chapter first reviews the procedures initiated as a result of Tactical Goal #10 to meet RDD and discusses their effectiveness. Next an examination of the factors used in determining SPCC's surcharge is discussed. Finally, a lost sales analysis is done to show the financial impact on SPCC from not meeting RDDs for Naval shipyards.

A. SPCC RDD MANAGEMENT

A significant step taken by SPCC to support the RDD Management process was the implementation of SPCC Internal Notice 4440. This provided a procedural change to SPCCINST 4440.467B of 22 Jul 87 which is the Requisition Processing Decision Matrix used by IMs to process requisitions. Before the Notice, RDD did not take a prominent role in making requisition processing decisions; only industrial IPG 1 (Priority 01,02 and 03) work stoppage requisitions could be spot procured according to the Matrix.

The Notice directs that all IPG 1 and 2 industrial requisitions in backorder status will be reviewed by RDD Managers and IMs on a regular basis. For backorders that cannot be filled to meet RDD, a spot procurement/spot repair will be processed after all other methods of RDD fulfillment (referral, reconsignment) have been examined and found to be unsuccessful in meeting RDD. If the requisition does not provide a RDD (i.e., the RDD field is blank) a RDD will be computed in accordance with DOD 4140.1-R.

The first step in the process occurs when SPCC's INDUSTRIAL UIC CULPRIT/FOCUS Program queries the UICP Open Requisition File for requisitions where the Estimated Availability Date (EAD) is greater than the RDD. A hardcopy report is generated by LRC (Local Routing Code), which is material grouped by Item Manager (IM), then it is routed to the Industrial Expeditors in Code 0311. The Expeditors will

call the industrial customer and verify the RDD and, where applicable, make modifications to the requisition's RDD upon concurrence by the customer. The Expeditors will also work with the IMs to either reassign other requisitions to the industrial customer or to initiate a cannibalization to meet the RDD. Cannibalizations will usually be made from ships being decommissioned or from weapons system held at Naval Weapons and Ordnance Stations.

The requisitions which cannot be filled by this means are routed to the RDD Managers in Code 033F. The RDD Managers options to fill the requisition are either through spot buy or spot repair. After actions have been completed to meet the RDD, program B04 of the UICP updates the requisitions with the new EAD or identifies the activity the requisition has been passed to for filling.

Overall, the RDD Manager's efforts, working in conjunction with the IM and Procurement Specialists, are paying off, not only to the benefit of SPCC, but also the industrial customer. The effectiveness of Code 033F's Industrial RDD management efforts are shown in Figures 3 and 4 for IPG 1 and 2 requisitions. A 1994 goal was established to decrease IPG 1 requisitions 20% to 950 and IPG 2 requisitions 30% to 1,190. In both cases, SPCC has exceeded its goals, especially in the case of IPG 1 requisitions which have decreased over 50% since the beginning of the year.

In accordance with SPCC Internal Notice 4440, RDD Managers are directed not to initiate spot procurement/spot repair action without the concurrence of cognizant IMs. If a spot buy is the agreed upon method to meet the industrial customer's RDD then the RDD Manager will prepare a spot buy folder with the specific item to be purchased as well as the company to be awarded the contract. As a result of the RDD Management PAT, a comprehensive checklist of signatures and

steps to perform a spot procurement was put into place to eliminate common processing errors and delays.

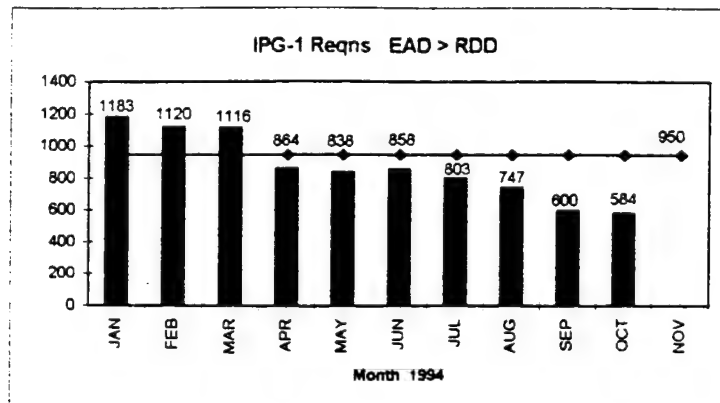


Figure 3. Code 033F IPG-1 Effectiveness.

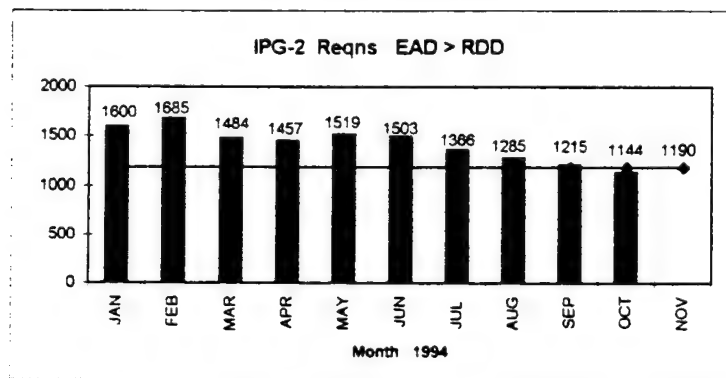


Figure 4. Code 033F IPG-2 Effectiveness.

Currently, Code 03 is moving from the manual folders to using ITIMPS (Integrated Technical Item Management and Procurement System). This is an interactive, menu-driven system to "speed up" the procurement process by eliminating the flow of paperwork. The system allows the contract specialists in Code 02 to work on contracts as they are passed via the system. The system sequences potential contracts by Priority. However, there are subroutines designed to "bump up" requirements with short RDDs (Port, 1994). Using ITIMPS

is an effective means for RDD Managers to obtain parts for industrial customers by their RDD.

1. Local Procurement Issues

As cited previously, industrial activities are reluctant to use the procurement services of SPCC, mainly because they do not want to lose "control" of the procurement. However, SPCCINST 4235.150 (Authority for Local Purchase or Manufacture of SPCC Centrally Managed Items) directs industrial customers to make every effort to identify requirements in sufficient time to allow for routine supply support. Industrial activities are authorized to purchase or manufacture material locally if all of the following conditions are met:

- (1) Material is required for immediate end use;
- (2) The item, or suitable substitute, is readily available from an acceptable commercial source;
- (3) The purchase will not circumvent the provisions of the Defense Federal Acquisition manual;
- (4) The purchase will not exceed purchase authority limitations set by Field Purchasing or other regulations; and
- (5) Adequate quality control standards can be applied locally for items involving health, safety or combat effectiveness.

Additionally, the only acceptable means of requesting or receiving local purchase authority from the IM (Inventory Manager) will be by electronic transmission in accordance with assigned Media and Status codes or by message. Telephone requests for local purchase will not be accepted.

In order to determine the responsiveness of SPCC purchase support, a hypothetical situation and question was posed to a Code 02 (Contracting Group) supervisor who wished to remain anonymous. "It is noon on a Monday and a shipyard shop has determined after an open and inspect job that it needs a pump

by tomorrow morning in order to continue the job. The pump is a SPCC-managed item which is currently not in stock, but it is available from a company in San Diego. Could SPCC provide the procurement services in order to meet the RDD of the shipyard and as a result, not lose a sale?"

The Code 02 Supervisor responded that the contracting shop at SPCC could respond, but that it is not "business as usual" because it would force adjustments to the work schedule. The supervisor went on to say that "the Contract Specialists don't approach work stoppages as aggressively as a CASREP which would force them to work overtime".

Other factors which inhibit the contracting effort are the constraints placed upon small and large purchases. For example, for a purchase over \$25,000, an advertisement must be made to all potential contractors in a journal such as the "Commerce Business Daily" or other media for a minimum of 30 days. This obviously increases the procurement lead time for an item.

In September 1994, the House and Senate agreed upon a landmark reform bill in an effort to streamline the Pentagon's procurement system. An important provision of the Bill would raise the threshold for making small purchases from \$25,000 to \$100,000. The Bill also includes provisions to establish a computerized network for advertising defense contracts. The goal is to transform the paperwork-laden process into a quick, electronic data interchange between the government and business (Navy Times, 1994). This will make the procurement process quicker and easier for SPCC and Naval shipyards.

2. The 80-20 Curve

Despite the minor shortcomings with local procurement issues, RDD management is making an impact as shown earlier in Figures 3 and 4. However, when attempting to determine the causes for the requisitions which continue to be backordered

and the specific NSNs affected, the personnel in Code 033 could not give a definite answer. They did provide a list of common reasons for backordered requisitions and systems with parts support problems such as AEGIS, Close-in Weapons System (CIWS) and the LM2500 Gas Turbine Engine. The list includes:

- Forecast lead time was wrong (i.e., too short)
- Quarterly Demand exceeded past historical Demand
- High dollar value part sent out for bid
(min of 90 days)
- Variabilities in the Repair pipeline; Repair
Turn-around Time (RTAT) or survival rate may be
wrong.

If Code 033 could provide a further breakdown of the continuing backordered requisitions, this would allow for management efforts to be directed to those items which would have the greatest impact on RDD effectiveness. For example, the requisitions still outstanding are either requisitions for separate and distinct NSNs or there are groups of requisitions for the same NSN. If the latter situation is the case, then the requisitions can be divided into NSN categories by cumulative percent of total items. This situation creates a product/stock phenomenon known as the 80-20 curve. This concept which is based on Pareto's Law, states that 80 percent of a firm's sales are generated by 20 percent of the product line items (Ballou, 1992). By doing this, managers at all levels would know at a glance what the problem parts are for industrial customers and where to focus their attention.

B. DETERMINATION OF SPCC SURCHARGES

The purpose of the surcharge is to balance total revenue with total net operating expenses (Revenue = Expenditures). It is the amount added by the ICP to the base price of material to cover not only purchase of the material but all

costs associated with ordering, holding and delivering the material. The formula for determining the surcharge percentage markup is:

$$\text{Surcharge} = \text{Cost of Operating} \div \text{Cost of Goods Sold}$$

As an example, the FY 1995 Composite Surcharge forecasted for all SPCC managed material is computed as follows:

$$\begin{aligned}\text{Cost of Operating} &= \$296.2\text{M} \\ \text{Cost of Goods Sold} &= \$629.6\text{M} \\ \$296.2\text{M}/\$629.6\text{M} &= 47.0\%\end{aligned}$$

Some of the factors which impact the amount of the surcharge are increased costs and a decreasing sales base. Increased costs are attributed to higher costs associated with Stock Funding Supply Operations. Some of these include ICP Operating Costs, Physical Distribution/Handling Costs and a Fair Share of Other Costs such as SPCC salaries. The decreasing sales base is a result of Consumable Item Transfers to DLA as well as the decrease in the size of the force structure. (Vaughn, 1994)

Table 10 provides an indication of the magnitude of the projected decreasing sales base.

	FY 1992	FY 1996
Number of USN Ships Supported	448	390
SPCC Items Centrally Managed (Cognizance Groups 1H/3H, 7E/G/H/Z)	358,300	194,000

Table 10. Reductions in Material and Sales Base.
(From SPCC Strategic Plan FY 1994 Update)

The various surcharge elements which are used to determine the Cost of Operating are listed in Table 11 and defined after that.

SURCHARGE ELEMENTS

Cost of Operating:

Line Item	FY95 \$(M)
SPCC Fair Share of Other BP91 Costs	161.6
DBOF Profit/Losses	(120.9)
DLA Reimbursement	118.5
ICP BP91	97.6
Depot Washout	20.0
Stock Losses	19.6
DLR Carcass Losses	13.3
Obsolescence	12.3
DMRD Savings	(25.8)
Total	\$296.2M

Table 11. Surcharge Elements.

a. SPCC Fair Share of Other Budget Program BP91 Costs:

These are the costs of operating other NAVSUP activities like the FISCs; included in this are salaries and utilities.

b. DBOF Profit/Losses: This is SPCC's fair share of Department of the Navy's profits and losses attributed to the Defense Business Operating Fund.

c. DLA Reimbursement: SPCC's share of the costs of operating the DLA warehouses; includes receiving, issuing and transportation.

d. ICP BP91: These are the cost of operating SPCC; includes salaries and utilities.

e. Depot Washout: This is the amount to buy replacement stock for those DLRs determined to be beyond economical repair.

f. Stock Losses: To account for the physical damage to inventory.

g. Carcass Losses: To account for DLRs which have never been returned to the supply system.

h. Obsolescence: A fixed charge against system inventory for those items which will lose their utility over the life of a supported system.

i. DMRD Savings: An efficiency savings directed by OSD as a result of DMR 971, DOD Financial Systems. This figure as determined by NAVSUP assumes a 1% productivity improvement each year until FY 1997.

Reviewing the information presented so far, two ways to lower the surcharge are to decrease the Costs of Operating or to increase the Cost of Goods Sold. The next section will analyze the impact of lost sales on SPCC and will show the benefits of managing shipyard requirements to RDD to increase the Cost of Goods Sold.

C. SHIPYARD LOST SALES ANALYSIS

NAVSUP has directed all industrial activities to submit a "record demand only" (Document Identifier Code (DIC) "DHA") Transaction Item Report (TIR) to SPCC for each SPCC centrally-managed item which had to be purchased or manufactured locally because SPCC was out of stock (NAVSUP P-437). From October 1993 to July 1994, \$3.9 million in "DHA" (demand only) transactions were submitted for 591 SPCC NSNs by all Naval Shipyards (Nordahl, 1994). This data gives an approximate indication of financial loss to SPCC for not meeting RDDs, keeping in mind that some of these sales could have been directed by the Item Manager (IM). On the other hand, some activities may be making inaccurate reports or not making reports at all.

In analyzing the data, the premise is that each lost sale should have resulted in a sale by SPCC, but the customer chose to fill the requirement with some other means (local purchase

or manufacture). The assumption is that the customer chose the local option because SPCC could not respond quick enough to meet their needs (Port, 1994). This alternative was identified in Chapter III where it was noted that several shipyard planning supervisors preferred local procurement over buying from SPCC. (Losing "control" and "response time" were the main reasons.) Furthermore, assume that these sales could have been made by SPCC, if spot buy or spot repair methods were used to meet RDD (Port, 1994).

In order to quantify the lost financial benefit to SPCC from these lost sales, the variable costs associated with the spot buy or spot repair should be compared to the surcharge that \$3.9M in sales would generate. The difference would be the net lost surcharge income. Previous analyses by SPCC Code 02 indicate that the variable cost per item ordered in a contract is \$1,521 (Industrial PAT Report, 1994). In addition, the surcharge used by SPCC for FY 1994 was 54% (Vaughan, 1994).

The first step is to separate the \$3.9M into base and surcharge elements:

Base =	\$2.520M	
Surcharge =	\$1.361M	(54%)

Second, Total Variable Cost is estimated to be:

\$1,521	Variable Cost per contract line item
X 591	Total NSN Hits
<u>\$.899M</u>	Total Variable Cost

Third, Lost Surcharge Net Income to SPCC:

\$1.361M	Surcharge from \$3.9M in Lost Sales
<u>- .899M</u>	Total Variable Cost
\$.462M	Lost Surcharge Net Income

Although these calculations are simplistic, keeping in mind the assumptions made in the very beginning, they do show that SPCC can gain financially and possibly reduce the surcharge to all customers. The way to achieve this is

through an aggressive and proactive RDD Management program with an emphasis on spot buy/spot repair not only for Naval Shipyards, but for all industrial customers. (Nordahl, 1994)

D. SUMMARY

This chapter has examined the initiatives taken by SPCC to support their Industrial Customers by managing backordered requisitions to meet RDD. Despite some of the shortcomings of the process, these initiatives are making progress in satisfying not only the needs of the shipyards but other industrial activities as well. For example, as shown in Figures 3 and 4, IPG-1 and IPG-2 requisitions have been reduced 50% and 30%, respectively since the beginning of 1994. Additionally, SPCC's surcharge and the financial impact of lost sales on this surcharge was reviewed. It was shown that if SPCC can make sales that would have been lost previously, then this financial gain can have the potential of lowering the surcharge for all customers.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

The objective of this thesis was to examine material support provided by the supply system to the Navy's shipyards. As discussed in Chapter I, a survey taken of all Navy industrial customers revealed that NAVSUP should be buying and issuing material to meet the RDD. To accomplish this goal, NAVSUP directed the formation of several Process Action Teams to improve its industrial support and to develop a RDD-based Measure of Effectiveness (MOE). The current MOE uses the date the material was shipped to determine on-time effectiveness. It does not take into consideration the transportation and receipt take-up segments of the requisition pipeline.

Chapter II described the material forecasting procedures used by Navy shipyard planners several years before a ship or submarine is scheduled to begin an overhaul. This procedure uses a Probability of Use (POU) factor to determine Mandatory and Contingent material requirements. These forecasts are provided to the supply system so that stock can be made available to support the future requirements. Two case studies were used to illustrate the shipyards' poor forecasting accuracy for both Navy-managed material and DLA-managed material.

Chapter II also introduced the Advanced Industrial Management Program, known as AIM. This program addresses many of the problems identified by Coopers and Lybrand in their 1985 assessment of Naval shipyards. One of the subsystems of AIM which will help in managing and forecasting material for all shipyard jobs is MR (Material Requirements). This system should greatly improve PERA material forecasting by providing a corporate data base of material usage, technical documentation and lessons learned.

Chapter III examined the material requisition pipeline including the shipyard's requisition submission process; passing actions by the POE and ICP stock determination; the issuing stock point's processing of the requisition; and transportation to the shipyard and material receipt by the shipyard. This chapter also discussed the DOD UMMIPS time standards which are service level targets to complete each segment of the requisition pipeline. In order to determine how successful each part of the pipeline was in meeting these standards for Navy shipyards, the average and median times to complete each segment were compared with the UMMIPS standards. It was found on average that the supply system can respond within the UMMIPS standards if requisitions are submitted in a timely manner with the RDD reasonably assigned.

Next, Chapter IV discussed the initiatives taken by SPCC to ensure that requisitions, held in open status with an Estimated Availability Date (EAD) greater than the RDD, are filled. This discussion focused on the options available to the RDD expeditors and managers including cannibalization, requisition reconsignment, spot buy and spot repair.

Chapter IV also examined SPCC's surcharge and conducted a lost sales analysis to determine the financial magnitude of not meeting the RDDs of shipyard customers. By SPCC being more proactively involved with the customer, sales could be made which would allow a reduction in the surcharge SPCC applies to all of its customers.

B. CONCLUSIONS

The following is a listing of the conclusions derived from this research.

1. Shipyard material forecasting procedures which generate PPRs and SPRs are inaccurate and cause the system to order and hold material that is often not

requisitioned by the shipyards. Additionally, if material is needed after the start of the availability and it was not forecasted as being needed, then there may not be enough items in the supply system to support the demand.

2. Navy and DLA ICPs cannot automatically match preplanned requirements against the shipyard requisitions to determine match rate accuracy.

3. Shipyard material usage data is not forwarded to the shipyard's planning activity or effectively used by the shipyard's Supply Department to plan future requirements.

4. When the Material Requirements (MR) subsystem of the Advanced Industrial Management (AIM) Program is implemented, it will help shipyard planners make more accurate material requirements forecasts by allowing them to have access to historical usage data in the shipyard corporate database.

5. The NAVSUP Corporate Information System does not accurately show the on-time performance of shipyard requisitions for SPCC and DLA managed material. The way the system currently works is that once "AS1" status is received in the Transaction History File (THF) for a requisition then the requisition is considered "filled". If the date of the AS1 is on or before the RDD, then it is considered to be on-time. This erroneously indicates that the supply system is meeting the RDD when, in fact, the customer still has not received the material. In addition, the number of RODs (Report of Discrepancy) submitted by Norfolk NSY for material missing in transit (which never arrives) is a problem for the customer, but CIS does not reflect this. CIS reports these as on-time filled requisitions.

6. Shipyard Planners and Supply Department personnel are not aware of the UMMIPS standards to complete each segment of the requisition pipeline. As a result, there is a propensity to assign unrealistic RDDs to the requisitions. This is compounded by the fact that it takes several days on average for the shipyard to process and submit a requisition to the supply system when the standard is one day.

7. For material known to be in stock in the supply system, if a requisition is submitted in accordance with the UMMIPS standards and a realistic RDD is assigned, taking into account the times for each segment of the requisition pipeline, the system can respond on time. However, for requisitions with a RDD shorter than the standard (i.e., two to three days), then manual intervention by SPCC or DLA is required to assure delivery on or before the RDD. For material known to be out of stock, SPCC's RDD management effort is a significant step in the right direction to satisfy the needs of its industrial customers. Through proactive involvement, SPCC now is making sales which in the past would have possibly been lost. This is evident by the decreases in IPG-1 and IPG-2 requisitions where the EAD > RDD.

8. Under the Guaranteed Traffic contract, normal deliveries are Monday through Friday (less holidays). If a customer assigns a RDD which happens to fall on a Saturday, then the material may not be received until Monday. In this instance, if the customer does not use some thought in assigning an RDD keeping that information in mind, on-time delivery may not be possible.

9. The guiding instruction for UMMIPS within the Navy, OPNAV Instruction 4614.1F, is outdated and does not

reflect the time standards as found in DOD Regulation 4140.1-R.

10. The Contracting Group (Code 02) at SPCC does not work industrial workstoppage requirements as aggressively as it does for CASREP requirements. This has led to the general attitude among shipyard planners to avoid SPCC and use local procurement instead. The main reason given by several planners was that "control" was lost by using SPCC's services.

C. RECOMMENDATIONS

The following recommendations are proposed to further improve the Navy's supply system support of the shipyard's mission.

1. Upon completion of the Work Definition Conference (WDC), the shipyards should provide both SPCC, DLA and the appropriate PERA a listing of all required maintenance material. SPCC and DLA personnel can use the lists to make a better match with PPR and SPR files and PERA can use the data to validate forecasting procedures.
2. SPCC should work with DLA representatives from the Industrial Forecasting Support Group (IFSG) to share information and solutions to increase the automated match rate between forecasted requirements and drawdown requisitions. One method to increase the match rate now is to increase the number of possible ways to match an industrial requisition to the PPR/SPR. For example, instead of matching on all five elements, various combinations from one to five should be selected and matched accordingly. DLA is testing this concept by developing a PC-based system called the SPR Automated Information System which will use information taken from their SAMMS (Standard Automated Material Management

System) database. DLA will use the data from this new SPR system to monitor the SPR program as well as to provide feedback to industrial activities to assist in forecast improvement.

3. SPCC should assign an RDD manager to each of the industrial activities to be the "one face" representative for parts support similar to DLA's Industrial Forecasting Support Group (IFSG). Then, whenever any parts support problem arises, the shipyard can talk directly with their designated point-of-contact to obtain all the answers quickly instead of taking the time to call multiple people. In the meantime, SPCC needs to advertise their RDD Management concept to the shipyards. Many planners the author spoke with were not aware of SPCC's efforts to assist them in obtaining material.

4. In order to improve assignment of RDDs, as well as to monitor and improve requisition submission times, the following steps should be implemented:

- a. Review daily a sample of requisitions by the shipyard Supply Officer or the Deputy to assure realistic RDDs are assigned.

- b. For manually generated JMLs, Supply Department personnel should change the Julian Date of the requisition to match the Julian Date it is transmitted to the supply system. Information should also be provided to the workcenter about the action taken.

- c. In order for shipyard managers and planners to become more familiar with UMMIPS standards, the Supply Department should develop decision charts or a simplified brochure which outlines the rules of the priority system and the time standards for each segment of the requisition pipeline. Training sessions which explain these decision aids and stress the importance of timely

requisition submission can help improve the performance of all shipyard personnel involved in the process.

5. OPNAVINST 4614.1F should be cancelled and a new instruction issued which reflects the UMMIPS standards as directed in DOD 4140.1-R.

6. NAVSUP should continue efforts to update the RDD On-Time MOE in the CIS to reflect the entire requisition pipeline. In the meantime, the current reports should not be used as a precise MOE. Since shipyards are apparently submitting their receipt information in a timely manner, this information can possibly be added to the CIS now in order to provide complete on-time performance. Other industrial activities can be added later when their receipt procedures improve. Additionally, to overcome the limitations caused by using Intransit Data Cards (IDC) to match with the "D6S" receipt report, NAVSUP should have SPCC discontinue using them. This would allow more requisitions to be used in obtaining MILSTEP data for the final segment of the requisition pipeline.

7. Since RDD is becoming one of the prime factors in determining supply system responsiveness, the potential exists for abuse by ordering activities. This can occur when ordering activities assign unrealistic RDDs which do not take into consideration the UMMIPS standards for each segment of the requisition pipeline. For example, if the assigned RDD is less than the UMMIPS standards, manual intervention at the ICP and ISP is often required to ensure that material arrives by the RDD. If ordering activities are charged a flat surcharge for the increased service, this should cause these activities to think through the process and assign a "realistic" RDD which meets the requisitioner's needs.

8. As another means not to lose industrial sales, SPCC Code 02 (Contracting Group) should provide the same service level in meeting workstoppage requisitions for industrial activities as it does with CASREP requisitions for Fleet units. The increased sales should offset any increase in overhead for providing this service.

In closing, since the focus of this thesis was on the concerns for Naval shipyards, it did not address the concerns of the other Navy industrial activities, namely Shore Intermediate Maintenance Activities (SIMA), Naval Aviation Depots (NADEP), Naval Weapons Stations (NWS), Naval Ordnance Stations (NAVORDSTA) and overseas Ship Repair Facilities (SRF). In addition, an examination of industrial support procedures at the Aviation Supply Office (ASO) Philadelphia was not conducted. Comparable research as was done in this thesis should be done for each of these customer categories. It would greatly assist NAVSUP's efforts to improve its responsiveness to all industrial customers.

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